भारतीय मानक
Indian Standard

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शीतल उपयोग हेतु एकल पैक समृद्ध कोटिंग — विशिष्टि

Single Pack Zinc Rich Coating for Cold Application — Specification

ICS 25.220.40

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भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली–110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.org.in www.standardsbis.in

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Corrosion Protection and Finishes Sectional Committee, MTD 24

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Corrosion Protection and Finishes Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This Cold Galvanizing is zinc rich paint based on epoxy ester resins, which protect steel from corrosion. This product contains metallic zinc, which allows for electrical contact to be made with the steel surface being coated. The metallic zinc is then sacrificed in preference to the steel, when exposed to corrosive environments, therefore ensuring long-term protection of the steel surface. This product has been specially formulated for easy application and is mineral turps thinned.

This Cold Galvanizing is used as a heavy-duty primer for atmospheric corrosion protection for iron and steel. It is most often used on structural steelwork in industrial and commercial environments, especially for the protection of buildings, bridges, cranes, pipelines and tanks. This product is also used for the repair of damaged galvanized iron.

For the purpose of deciding whether a particular requirements of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SINGLE PACK ZINC RICH COATING FOR COLD APPLICATION — SPECIFICATION

1 SCOPE

This standard prescribes requirements and methods of sampling and test for single pack zinc rich coating for cold application, which can be applied by brush/ roller/ spraying on a cleaned substrate. The coating provides long-term corrosion protection of steel against mild/ moderate atmospheric conditions.

2 REFERENCES

The following standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1303 shall apply.

4 REQUIREMENTS

4.1 Composition

The coating shall be based on single pack unsaturated aromatic hydrocarbons like poly-aniline or its derivatives as resin binder, zinc dust, and organic solvents. The metallic zinc content of the coating, when calculated as per IS 101 (Part 8/Sec 2) shall not be less than 92 percent by mass, and purity of zinc shall be between 97-99 percent.

4.2 Metallic Zinc Dust

The size, shape and other technical requirements of metallic zinc dust used in the formulation of the coating shall in accordance with IS 14355.

4.3 Mass per 10 Litres

The mass per 10 litre of the coating material when determined by method described in IS 101 (Part 1/ Sec 7) shall be 26.0 kg (minimum).

4.4 Other Requirements

The coating shall also comply with requirements given in Table 1.

Table 1 Requirements of Single Pack Zinc Rich Coating for Cold Application
(*Clause* 4.4)

Sl No. (1)	Characteristics (2)	Requirements (3)	Methods of Test, Ref to IS 101 and Annex A of this Standard (4)
i)	Consistency	Smooth and uniform	Part 1/Sec 5
	a) Flow time	40-60 s at 27°C	
ii)	Drying time		Part 3/ Sec 1
	a) Surface/Touch dry	10 min, *Max*	
	b) Dry to handle	1 h, *Max*	
	c) Full cure	48 h, *Max*	
iii)	Finish	Smooth and matt	Part 3/Sec 4
iv)	Colour	Grey	Part 4/Sec 2
v)	Non-volatile matter	80%, *Min*	Part 2/Sec 2
vi)	Zinc content by mass in dried coating	90%, *Min*	Part 8/Sec 2
vii)	Volume solids	55%, *Min*	Part 8/Sec 6
viii)	Dry film thickness	40 microns, *Min*	Part 3/Sec 2
ix)	Protection against corrosion under conditions of condensation	To pass the test for 5 000 h, *Min*	Part 6/Sec 1
x)	Flash point	40°C, *Min*	Part 1/Sec 6
xi)	Resistance to salt spray	To pass the test for 2 000 h, *Min*	Annex B
xii)	Effect of welding	To pass the test	Annex C
xiii)	Pot life	To pass the test	Annex D
xiv)	Theoretical coverage at 60 µm DFT	9.5 m^2/litre, *Min*	Part 4/Sec 1
xv)	Keeping property	Not less than one year	Part 6/Sec 2
xvi)	Adhesion (cross cut test)	To pass the test	Part 5/Sec 2
xvii)	Purity of zinc	95%, *Min*	IS 4611
xviii)	Potential-time variation	Potential shall remain more active than –800 mV (Saturated Calomel Electrode) up to 2 000 h in 3.5 percent sodium chloride solution	Annex E

5.1 Packing

The material shall be packed as agreed to between the purchaser and the supplier.

5.2 Marking

The material shall be marked with the following particulars:

a) Name-Trade name of the material;
b) Indication of the source of material;
c) Net mass of the material; and
d) Batch No. or Lot No. in code or relevant data regarding details of manufacture and year of manufacture.

5.3 BIS Certification Marking

The material may also be marked with the standard mark.

5.3.1 The use of standard mark is governed by the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of standard mark may be granted to manufacturers or producer may be obtained from Bureau of Indian Standards.

6 SAMPLING

Representative samples of the materials shall be drawn as prescribed in IS 101 (Part 1/Sec 1).

6.1 Scale of Sampling and Criteria of Conformity

6.1.1 The number of test samples to be selected and the criteria of conformity is given in Table 2.

Table 2 Number of Test Samples to be Selected and the Criteria of Conformity

(*Clause* 6.1.1)

No. of Units in the Lot (1)	No. of Units to be Selected for Preparation of Test Panels (2)	Acceptance No. (3)
Up to 25	3	0
26-100	5	0
101-150	8	1
151-500	13	1
501-1 000	20	2
1 001-10 000	32	3
10 001 and Above	50	5

NOTES

1 One test panel to be prepared from each unit selected.

2 For details of acceptance number reference may be made to IS 2500 (Part 1).

7 TEST METHODS

Unless specified otherwise, the various tests on the sample shall be carried out as indicated in col 4 of Table 1.

ANNEX A

(*Clause* 2)

LIST OF REFERRED AND RELATED INDIAN STANDARDS

IS No.	*Title*
101	Methods of sampling and test for paints, varnishes and related products
(Part 1/Sec 1) : 1986	Test on liquid paints (general and physical), Section 1 Sampling (*third revision*)
(Part 1/Sec 5) : 1989	Test on liquid paints (general and physical), Section 5 Consistency (*third revision*)
(Part 1/Sec 6) : 1987	Test on liquid paints (general and physical), Section 6 Flash point (*third revision*)
(Part 1/Sec 7) : 1987	Test on liquid paints (general and physical), Section 7 Mass per 10 litres (*third revision*)
(Part 2/Sec 2) : 1986	Test on liquid paints (chemical examination), Section 2 Volatile matter (*third revision*)
(Part 3/Sec 1) : 1986	Test on paint film formation, Section 1 Drying time (*third revision*)
(Part 3/Sec 2) : 1989	Test on paint film formation, Section 2 Film thickness (*third revision*)
(Part 3/Sec 4) : 1987	Test on paint film formation, Section 4 Finish (*third revision*)
(Part 4/Sec 2) : 1989	Optical test on paint films, Section 2 Colour (*third revision*)
(Part 6/Sec 1) : 1988	Durability test on paint films, Section 1 Resistance to humidityunder conditions of condensation (*third revision*)
(Part 6/Sec 2) : 1989	Durability test on paint films, Section 2 Keeping property (*third revision*)

IS No.	*Title*
(Part 8/Sec 2): 1990	Tests for pigments and other solids, Section 2 Pigments and non-volatile matter (*third revision*)
(Part 8/Sec 6): 1993	Tests for pigments and other solids, Section 6 Volume solids
1303: 1983	Glossary of terms relating to paints (*second revision*)
2500 (Part 1): 2000	Sampling procedure for inspection by attributes (*third revision*)
4611 : 1991	Metallic zinc powder (zinc dust) (*second revision*)
14355 : 1996	Zinc dust pigment for paints — Specification
14589 : 1999	Zinc priming paint, epoxy based, two pack — Specification
14946 : 2001	Zinc ethyl silicate primer — Specification

ANNEX B

[*Table* 1*, Sl No.* (xi)]

RESISTANCE TO SALT SPRAY TEST

B-0 GENERAL

The coated panels are subjected to salt spray for stipulated number of days and the coating is examined for any deterioration.

B-1 PROCEDURE

B-1.1 Prepare test panels of size 10 cm × 5 cm × 0.1 cm of mild steel through abrasive blast.The number of test panels to be prepared is as per Table 2. The test panel blasted surface shall be prepared as per the standard Sa 2.5 of ISO 8501-1 : 2007 and the surface roughness shall be 50 to 70 Microns before the coating application. Apply the coating of 45 ± 5 µm thickness. The resistance of the coating to a hot, wet corrosive environment shall be evaluated by exposing coated panels to 35 ± 2°C salt spray comprised of 5 percent NaCl by mass dissolved in distilled water, for 2 000 h. The coated panels shall be placed horizontally in the cabinet. The test specimens shall be allowed to cool for about 1 h prior to evaluation.

B-1.2 Examine the panels visually for any deterioration of coating and the acceptance criteria as per Table 2.

ANNEX C

[*Table* 1*, Sl No.* (xii)]

DETERMINATION OF EFFECT OF WELDING

C-0 GENERAL

The coated mild steel plates are welded and the weld is examined for porosity and mechanical properties alongwith a control weld assembly.

C-1 PROCEDURE

C-1.1 Test Plate

Use mild steel plates of size 500 mm × 150 mm × 20 mm for making the weld test assemblies. A single U-notch is made on longitudinal edge panel.

C-1.2 Preparation of Weld Assembly

Abrasive blast two plates including the edges and apply the coating of 45 ± 5 µm thickness. Allow the coating to dry for 48 h minimum. Prepare the test assembly by welding the plates together using appropriate consumable electrodes. Abrasive blast the control assembly plates and weld in a similar fashion.

C-1.3 Examination of Test Assemblies

Test assemblies shall be examined for the test given below:

a) *Radiographs* — These shall have a sensitivity of better than 2 percent of the plate thickness under examination.

b) *Photo-macrographs* — These may be of actual size and shall be taken from near each end and the centre of the weld.

c) *Face and reverse bend test* — The test specimens shall be bent by pressure round a former of diameter equal to three times the plate thickness.

d) *Impact test* — These shall be carried out at ambient temperature of three charpy U-notch test specimens prepared in accordance with IS 1499. The specimens shall be notched at the central line of the weld, perpendicular to the plate surface.

e) *Tensile test* — Ultimate tensile strength shall be determined in accordance with IS1608 keeping the weld joint in the middle of the test piece.

C-1.4 The coating shall be deemed to have passed the test if porosity in the coated weldassemblies does not exceed 10 percent than that of control weld assemblies. The results ofother tests on weld with coating shall not be below the minimum specified values of control welds.

ANNEX D

[*Table* 1 *Sl No.* (xiii)]

DETERMINATION OF POT LIFE

D-1 Condition the contents of the coating for 1 h at 25°C and homogenize the contentsby thorough mixing. Keep the homogenized coating material in a can.

D-2 Measure the viscosity initially and every hour thereafter; however the length of intervalmay be decided, if desired, taking into consideration the ambient conditions.

D-3 Viscosity builds up rapidly near the end of working pot life of the coating. During thisperiod if the coating becomes too viscous to spray, remove a small portion and add appropriate thinner. If the coating material could still be thinned, the end of working life has not been reached. The end of working life is reached when the test material gels, becomes stringy or cannot be thinned for application.

D-4 Report the working life in the appropriate time units.

ANNEX E

[*Table* 1 *Sl No.* (xviii)]

POTENTIAL TIME VARIATION TEST

E-0 GENERAL

The coated panels are exposed to 3.5 percent NaCl solution and variation of potential with time is determined.

E-1 PROCEDURE

E-1.1 Preparation of Test Assemblies

Prepare test panels of size 10 cm × 5 cm × 0.1 cm of mild steel through abrasive blast cleaning. The number of test panels to be prepared is as per Table 2. The test panel blasted surface shall be prepared as per the standard Sa 2.5 of ISO 8501-1 : 2007 and the surface roughness shall be 50 to 70 microns before the coating application. Apply the coating of 45 ± 5 µm thickness. 4 cm length of the panels shall be exposed in 3.5 percent NaCl solution. The panels shall be coated with paraffin wax at the air-water interface so that it does not come in contact with test electrolyte. A crocodile clip connected with insulated copper wire shall be used to make connection of immersed coated panels with a high impedance voltmeter. A saturated calomel electrode shall be used as the reference electrode to measure the corrosion potential of coated panels. The saturated calomel electrode shall be kept in a separate beaker having saturated KCl solution and electrolytic contact between the test solution (3.5 percent NaCl solution) and calomel electrode shall be made by putting two ends of salt bridge in these two beakers.

E-1.2 Examination of Test Assemblies

A high impedance voltmeter shall be used to measure the potential developed between the coated panels and calomel electrode. The negative lead of voltmeter shall be connected to the calomel electrode and the positive lead to the coated panel.

E-1.3 The potential shall be measured after every 8 h of exposure and shouldcontinue minimum for 2000 h. During this period of test, the potential shall not increase above - 800 mV (with respect to saturated calomel electrode).

E-1.4 The acceptance criteria of the test is as per Table 2.

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BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.org.in

Regional Offices: *Telephones*

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002 { 2323 7617, 2323 3841

Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi
KOLKATA 700054 { 2337 8499, 2337 8561, 2337 8626, 2337 9120

Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, CHANDIGARH 160019 { 26 50206, 265 0290

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113 { 2254 1216, 2254 1442, 2254 2519, 2254 2315

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400093 { 2832 9295, 2832 7858, 2832 7891, 2832 7892

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